Manager Uncertainty and the Cross-Section of Stock Returns

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Uncertainty in a Time of Coronavirus

Fed's Mester says coronavirus uncertainty could lead to demand shock - CNBC

REUTERS Reuters March 4, 2020

Uncertainty is Trending Up in Academia

Measuring economic policy uncertainty

SR Baker, N Bloom, SJ Davis - The quarterly journal of …, 2016 - academic.oup.com

We develop a new index of economic policy uncertainty (EPU) based on newspaper coverage frequency. Several types of evidence—including human readings of 12,000 newspaper articles—indicate that our index proxies for movements in policy-related …

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Measuring uncertainty

K Jurado, SC Ludvigson, S Ng - American Economic Review, 2015 - aeaweb.org

This paper exploits a data rich environment to provide direct econometric estimates of time-varying macroeconomic uncertainty. Our estimates display significant independent variations from popular uncertainty proxies, suggesting that much of the variation in the …

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Research Question:
Uncertainty Measures and Asset Pricing

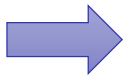
- Existing uncertainty measures are market-based or at aggregate level.

- Investors have incentive to acquire information to reduce uncertainty about fundamentals. (Mele and Sangiorgi, 2015 RES)

- Information frictions between firms' reported exposures and investors' perceived exposures due to readability and inattention. (Loughran and McDonald, 2014 JF; Cohen et al., 2020 JF)

- Whether firms' reported uncertainty has pricing power to cross-sectional stock returns?

✓ This paper tries to cover this gap.



Findings Take-away

- Manager uncertainty (MU)
  - The degree of managers' uncertain beliefs about future states.
  - The count of the word "uncertainty" over the sum of the count of the word "uncertainty" and the count of the word "risk" in filings and conference calls.

- Main findings
  - Negative explanatory power to cross-sectional stock returns.
    - Consistent with real options theory
    - High manager uncertainty is associated with precautionary behaviors
    - Investors favor firms with high manager uncertainty
  - Incremental pricing power to stock returns beyond market-based uncertainty measures
  - Cannot be spanned by existing factor models

Motivation: Word cloud--Uncertainty

- When managers use the word "uncertainty", they are more likely to describe macroeconomic or rare events, such as political events, regulations, terrorism, and environmental disasters.

Motivation: Word cloud--Risk

- When firms use the word "risk", they are more likely to describe firm-specific issues, such as investment, bank loan, competition…

Manager Uncertainty: Intuition

- Vocabulary choice reflects managers' subjective beliefs about future states.
- The choice between "uncertainty" and "risk" is conditional on managers' information of the probability distribution of future states.
- **Manager Uncertainty (MU)**

$$MU = \frac{N_{uncertain}}{N_{uncertain}+N_{risk}}$$

  - $N_{uncertain}$ is the clean number of the word "uncertainty"
  - N_{risk} is the clean number of the word "risk"

- It capture managers' degree of uncertainty on probability distribution of future outcomes/states.
- E.g., what is the percentage of cases that managers think the future is unpredictable? What is the percentage managers think the impact of exposures is unmeasurable?

Uncertainty versus Risk

	Uncertainty	Risk	Source
Probability distribution	Unknown	Known	Knight (1921)
Outcome	Unknown	Unknown	Knight (1921)
Knowledge	No	Yes	Epstein and Schneider (2010)
Examples	Disasters (coronavirus), Political (trade war)	Natural (seasonal flu), Firm-specific (collateral)	

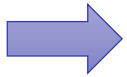
- Decision-making process: (1) belief formation; (2) valuation.
- The magnitude of uncertainty is in the belief formation stage while the magnitude of risk is in the valuation stage. ((Brenner and Izhakian, 2018 JFE)

Why distinguishing risk and uncertainty?

- MU conveys managers' perception of exposure types (unknown versus known) of their business.
- "$N_{uncertian}+N_{risk}$" reflects firms' overall exposures and is a better denominator.

- $$\mathbf{RUR} = \frac{\mathbf{N_{uncertain}}}{\mathbf{N_{uncertain}+N_{risk}}}$$

- For comparison:
- Handley and Li (2018): $\frac{N_{uncertain}}{N_{doc}}$
- Loughran and Macdonald (2011 JF): $\frac{N_{uncertain}+N_{risk}+\cdots}{N_{doc}}$
- Hassan et al. (2020 QJE): $\frac{N_{uncertain}+N_{risk}}{N_{doc}}$



Manager Uncertainty: A Textual-Based Measure

- **Manager Uncertainty (MU)**

$$MU = \frac{N_{uncertain}}{N_{uncertain}+N_{risk}} = \frac{N^{*}_{uncertain}-N_{risk\_uncertainty}-N_{uncertain\_tax}}{N^{*}_{uncertain}-2\times N_{risk\_uncertainty}-N_{uncertain\_tax}+N^{*}_{risk}-N_{risk\_factor}}$$

  - $N_{uncertain}$ is the clean number of the word "uncertainty"
  - N_{risk} is the clean number of the word "risk"

- Source: DirectEdgar and Conference call transcripts
- Firm-calendar year level, summation of one 10-K and three 10-Qs.
- Range: [0,1] Sample period: 1993-2018
- Covers 9,840 firms each year.

10-Q Apple Inc. May 1, 2020

Item 1A. Risk Factors

The business, financial condition and operating results of the Company can be affected by a number of factors, whether currently known or unknown, including but not limited to those described in Part I, Item 1A of the 2019 Form 10-K under the heading "Risk Factors," any one or more of which could, directly or indirectly, cause the Company's actual financial condition and operating results to vary materially from past, or from anticipated future, financial condition and operating results. Any of these factors, in whole or in part, could materially and adversely affect the Company's business, financial condition, operating results and stock price. Except as set forth below, there have been no material changes to the Company's risk factors since the 2019 Form 10-K.

The Company's business, results of operations, financial condition and stock price have been adversely affected and could in the future be materially adversely affected

The full extent of the impact of the COVID-19 pandemic on the Company's operational and financial performance is currently uncertain and will depend on many factors outside the Company's control, including …

COVID-19 pandemic has continued to adversely impact demand for certain of the Company's products and services through April 2020.

The Company is continuing to monitor the situation and take appropriate actions in accordance with the recommendations and requirements of relevant authorities. The full extent of the impact of the COVID-19 pandemic on the Company's operational and financial performance is currently uncertain and will depend on many factors outside the Company's control, including, without limitation, the timing, extent, trajectory and duration of the pandemic, the development and availability of effective treatments and vaccines, the imposition of protective public safety measures, and the impact of the pandemic on the global economy and demand for consumer products. Additional future impacts on the Company may include, but are not limited to, material adverse effects on: demand for the Company's products and services; the Company's supply chain and sales and distribution channels; the Company's ability to execute its strategic plans; and the Company's profitability and cost structure.

Hypothesis: Negative Pricing

- **H1: high-MU firms have lower expected return than low-MU firms.**
- Real Options theory models firms' investment dynamic under uncertainty (Dixit and Pindyck, 1994).
- With the irreversibility of investment and uncertainty, firms' investment decisions are analogous to financial call options.
- To capitalize real options value, high-MU firms would wait-and-see and are more likely to be precautionary and conservative in investments.
- High-MU firms make more contingent plans and have high flexibility and thus lower adjustment costs in bad times.
- Investors favor high-MU firms and are willing to pay higher prices to hold these stocks thus accept lower premium.

Data

- 10-K/10-Q filings: DirectEdgar
- Earnings call transcripts: S&P Capital IQ
- Return related: CRSP, CCM
- Firm characteristics: Compustat
- Option related: OptionMetric, WRDS Option Suite
- Textual related: SEC Analytic Suite
- Analysts' forecast: I/B/E/S
- Factors: authors' websites

- 21 firm-year level; 17 firm-month level; 29 factors; 15 beta loadings.

Fama-MacBeth Regression
Control textual-based factors

Dependent Variable: Monthly Excess Returns

	(1)	(2)	(3)	(4)	(5)	(6)
MU	-1.274***	-1.663***	-1.421**	-1.155***	-1.107***	-0.782***
	(-3.47)	(-3.56)	(-2.23)	(-3.42)	(-3.03)	(-5.35)
$N_{uncertain}$	-0.010					
	(-1.39)					
N_{risk}	0.000					
	(0.06)					
$\frac{N_{uncertain}}{N_{doc}}$		1.815		-0.548	-0.390	
		(0.42)		(-0.20)	(-0.14)	
$\frac{N_{risk}}{N_{doc}}$		-0.476		-0.324	-0.404	
		(-0.57)		(-0.38)	(-0.45)	
Negative Sentiment			-0.295**	-0.325*		
			(-2.48)	(-1.86)		
Positive Sentiment			1.063***	1.020***		
			(3.25)	(4.76)		
Uncertain Sentiment			0.064	0.143	0.265	
			(0.35)	(0.84)	(1.26)	
Management Tone					0.382***	
					(3.49)	
Smog Readability				-0.064*	-0.046	
				(-1.67)	(-1.29)	
MU#Dummy2005						-0.026***
						(-8.86)
Dummy2005						-0.313***
						(-5.61)
Obs.	3801	3801	3752	3599	3599	3801
Adj. R^2	0.009	0.039	0.0509	0.0569	0.053	0.005

Fama-MacBeth Regression

Control existing uncertainty measures and firm characteristics

Dependent Variable: Monthly Excess Returns

	(1)	(2)	(3)	(4)	(5)
MU	-0.931***	-1.472***	-0.646**	-1.931***	-1.971***
	(-3.08)	(-4.54)	(-2.35)	(-2.85)	(-4.54)
Implied Volatility	-2.814***		-6.572***		
	(-3.36)		(-8.21)		
Realized Volatility	-0.202		-0.225		
	(-0.27)		(-0.35)		
Volatility of Volatility	71.551***		62.189***		
	(5.07)		(4.01)		
Idiosyncratic Volatility	-6.536***		-2.322		
	(-3.32)		(-1.32)		
Analysts' Dispersion	-0.055*		-0.084**		
	(-1.87)		(-2.00)		
Market Beta		-0.077	0.279**		-0.169
		(-0.55)	(2.15)		(-1.28)
Firm Size		-0.247***	-0.631***		-0.353***
		(-5.22)	(-10.21)		(-6.18)
Book-to-Market		-1.018***	-1.056***		-1.011***
		(-7.35)	(-6.55)		(-7.26)
Investment		-0.361***	-0.343***		-0.366***
		(-6.52)	(-4.05)		(-6.64)
Profitability		0.128	-0.939***		0.133
		(1.45)	(-3.88)		(1.50)
Momentum		-0.005***	-0.006***		-0.004***
		(-3.09)	(-2.67)		(-2.87)
Reversal		-0.008**	-0.017***		-0.008**
		(-2.48)	(-3.25)		(-2.43)
Liquidity		-0.009***	-1.482***		-0.009***
		(-6.17)	(-5.08)		(-6.17)
Skewness		-0.051	0.045		-0.042
		(-0.30)	(0.13)		(-0.24)
Kurtosis		-0.140	-0.116		-0.144
		(-1.28)	(-0.84)		(-1.29)
MU#Dummy_option				1.012**	0.636*
				(2.38)	(1.82)
Dummy_option				0.129	0.593***
				(0.97)	(4.31)
Constant	1.819***	1.991***	6.768***	0.879***	2.422***
	(4.29)	(5.56)	(8.89)	(3.11)	(6.08)
Obs.	1385	2734	1084	3801	2734
Adj. R^2	0.085	0.070	0.158	0.009	0.073

Predictive Regression over Long Horizons

- Monthly MU:

  For month t, I compute the MU from month t-11 to t.

- Slow-moving

- The predictive power lasts 9 months.

Dependent Variable: Monthly Excess Returns

(1)	(2) Coef	(3) T-statistics	(4) Obs.	(5) Adj. R^2
T	-0.711**	(-2.22)	2,687	0.058
T+1	-0.673**	(-2.08)	2,682	0.057
T+2	-0.680**	(-2.12)	2,679	0.059
T+3	-0.643**	(-2.01)	2,676	0.058
T+4	-0.634**	(-1.98)	2,673	0.059
T+5	-0.663**	(-2.11)	2,670	0.059
T+6	-0.640**	(-2.03)	2,667	0.059
T+7	-0.611**	(-1.96)	2,662	0.060
T+8	-0.625**	(-2.02)	2,660	0.059
T+9	-0.653**	(-2.09)	2,658	0.059
T+10	-0.578*	(-1.86)	2,655	0.059
T+11	-0.569*	(-1.82)	2,652	0.059
T+12	-0.587*	(-1.88)	2,649	0.059
T+13	-0.570*	(-1.82)	2,648	0.059
T+14	-0.638**	(-2.03)	2,646	0.060
T+15	-0.609*	(-1.94)	2,642	0.059
T+16	-0.553*	(-1.73)	2,641	0.060
T+17	-0.534*	(-1.66)	2,636	0.060
T+18	-0.523	(-1.62)	2,635	0.060

Application: COVID-19 Uncertainty

Schrager, A. 2020. Risk, Uncertainty and Coronavirus. *Wall Street Journal*, March 23. Available at https://www.wsj.com/articles/risk-uncertainty-and-coronavirus-11584975787

COVID-19 Uncertainty

--Examples in Conference Calls

- And with the coronavirus, it's creating a patch of uncertain headwinds on our undercarriage business. (Titan Inc., 03/04/2020)
- Obviously, a lot of additional uncertainty around the coronavirus. (ViacomCBS Inc., 03/04/2020)
- Our guidance does include a certain level of caution, given our focus on continuing to stabilize the business as well as the uncertainty of the current macro environment, including the coronavirus. (J.Jill Inc., 03/04/2020)

- We have a plan and an internal team led by…, both of whom have extensive experience with the flu and other high-risk situations. (Centene Corporation, 03/04/2020)
- We reduced our risk adjuster position by $50 million and the flu season started earlier than normal, resulting in more flu costs than expected in the fourth quarter. (Anthem Inc., 01/29/2020)

COVID-19 Uncertainty

➢ COVID-19-related Manager Uncertainty Measurement

- First, I create a word list for COVID-19 by using word embedding in conference calls;
- Second, I locate all COVID-19-related paragraphs by using the word list;
- Third, I compute COVID-19-related manager uncertainty by using the relative word counts between uncertainty and risk.

- Reference:

Li, Kai and Liu, Xing and Mai, Feng and Zhang, Tengfei, The Role of Corporate Culture in Bad Times: Evidence from the COVID-19 Pandemic (June 21, 2020). Available at SSRN: https://ssrn.com/abstract=3632395 or http://dx.doi.org/10.2139/ssrn.3632395

COVID-19 Uncertainty-Continue

Dependent variable: excess returns in the first quarter of 2020.

Control variables: beta loadings of Fama and French (2018) six-factor model.

	(1)	(2)	(3)	(4)	(5)	(6)
Covid_MU	-4.928***	-4.921***	-4.610***	-3.772***	-4.198***	-2.908**
	(-3.57)	(-3.56)	(-3.34)	(-2.76)	(-3.07)	(-2.16)
β^{MKT}		0.035	0.070	-0.355	0.424	-0.025
		(0.12)	(0.19)	(-0.77)	(1.22)	(-0.06)
β^{SMB}			-0.006	-0.284	-0.019	-0.423
			(-0.02)	(-1.09)	(-0.08)	(-1.57)
β^{HML}			-1.245***	-3.264***	-2.899***	-6.759***
			(-3.88)	(-7.52)	(-6.26)	(-11.17)
β^{UMD}				5.133***		7.207***
				(7.16)		(9.04)
β^{RMW}					-0.627***	-0.686***
					(-2.78)	(-3.23)
β^{CMA}					-1.725***	-2.876***
					(-5.41)	(-7.83)
Constant	-33.976***	-34.017***	-34.250***	-33.526***	-34.902***	-34.107***
	(-34.05)	(-33.23)	(-31.90)	(-30.74)	(-32.95)	(-32.40)
Obs.	1980	1980	1980	1980	1980	1980
R^2	0.007	0.007	0.017	0.055	0.038	0.105

Portfolio Analysis—Sorting by MU

Manager Uncertainty Factor: long low-MU firms and short high-MU firms

Quintiles	MU	R (raw return)	R (excess return)
1 (low)	0.023	1.100***	0.879***
		(4.52)	(3.56)
2	0.083	1.090***	0.951***
		(3.47)	(3.12)
3	0.134	0.953***	0.784***
		(3.00)	(2.44)
4	0.218	0.813***	0.636*
		(2.36)	(1.85)
5 (high)	0.379	0.617*	0.451
		(1.76)	(1.28)
low (1)-high(5)		0.482***	0.427***
		(2.74)	(2.44)

Manager Uncertainty Factor (MUF):
Relation with existing aggregate uncertainty measures

Dependent Variable: MUF

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)
Macro Uncertainty Index 1-month-ahead	-2.003							-7.606***
	(-0.92)							(-3.43)
Macro Uncertainty Index 3-month-ahead		-1.928						
		(-0.89)						
Macro Uncertainty Index 12-month-ahead			-3.575					
			(-0.94)					
Economic Policy Uncertainty				0.008*				0.000
				(1.85)				(0.09)
Equity Market Volatility					0.094***			0.102**
					(4.55)			(2.34)
Volatility Index (VIX)						0.049**		0.031
						(2.06)		(0.70)
Variance Risk Premium							-0.015*	-0.017**
							(-1.75)	(-2.30)
Constant	1.776	1.984	3.722	-0.371	-1.444***	-0.461	0.712***	2.914**
	(1.30)	(1.22)	(1.10)	(-0.80)	(-3.60)	(-1.12)	(3.62)	(2.17)
Obs.	312	312	312	312	312	312	312	312
Adj. R^2	0.004	0.003	0.004	0.012	0.060	0.015	0.011	0.100

Manager Uncertainty Factor (MUF): Spanning tests by existing factor models

Dependent Variable: MUF

	(1)	(2) CAPM	(3) FF3	(4) FF5	(5) FF6	(6) HXZ4	(7) DMRS5	(8) SY4	(9) DHS3	(10) LASSO
MKT_RF		-0.348***	-0.256***	-0.193***	-0.155***	-0.099***	0.105	-0.114**	-0.093**	-0.106***
		(-8.36)	(-7.87)	(-5.61)	(-4.90)	(-2.63)	(1.15)	(-2.48)	(-2.42)	(-3.35)
SMB			-0.321***	-0.177***	-0.198***	-0.167***	-0.031	-0.218***		-0.159***
			(-7.02)	(-3.54)	(-4.39)	(-4.20)	(-0.30)	(-3.88)		(-3.45)
HML			0.406***	0.336***	0.379***		0.655***			0.266***
			(8.88)	(6.65)	(7.83)		(3.77)			(4.76)
RMW				0.352***	0.338***	0.543***	0.566***			0.332***
				(4.64)	(4.84)	(8.15)	(3.11)			(4.72)
CMA				-0.341**	-0.310**	0.377***	-0.512***			-0.417***
				(-2.29)	(-2.33)	(5.84)	(-2.88)			(-3.10)
UMD					0.112***					0.102***
					(3.77)					(3.57)
MGMT								0.512***		0.198***
								(8.86)		(2.82)
PERF								0.085**		
								(2.03)		
PEAD									0.101	
									(1.52)	
FIN									0.459***	
									(12.88)	
Intercept	0.482***	0.701***	0.611***	0.523***	0.438***	0.272**	0.313*	0.275*	0.247*	0.324***
	(2.81)	(4.47)	(4.97)	(4.55)	(3.90)	(2.10)	(1.96)	(1.74)	(1.71)	(2.73)
Obs.	312	312	312	312	312	312	312	288	312	288
R^2	0.000	0.235	0.518	0.608	0.635	0.576	0.174	0.496	0.544	0.666

Horse Race on Cross-Sectional Pricing: Characteristics versus Covariance

Dependent Variable: Excess Returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
β^{MUF}	0.106**	0.086**	0.086**	0.081	0.090*	0.004	-0.022
	(2.51)	(2.16)	(2.39)	(1.50)	(1.95)	(0.12)	(-0.43)
MU		-1.403***	-1.373***	-1.391***	-1.519***	-0.627***	-0.556***
		(-4.04)	(-5.81)	(-4.29)	(-6.93)	(-2.73)	(-2.72)
$\beta^{\text{macro Uncertainty Index}}$				-0.000	-0.001		0.002
				(-0.04)	(-0.13)		(0.17)
$\beta^{\text{Economic Policy Uncertainty}}$				9.228**	11.822**		11.943**
				(2.19)	(2.59)		(2.37)
$\beta^{\text{Equity Market Volatility}}$				-1.370*	-1.607**		-1.885**
				(-1.87)	(-2.23)		(-2.21)
$\beta^{\text{Volatility Index}}$				1.133	1.418		1.852*
				(1.18)	(1.48)		(1.69)
Implied Volatility						-5.585***	-5.341***
						(-7.44)	(-8.36)
Realized Volatility						-0.613	-0.270
						(-1.19)	(-0.55)
Volatility of Volatility						51.017***	50.524***
						(3.60)	(4.00)
Idiosyncratic Volatility						-2.095	-0.847
						(-1.41)	(-0.64)
Analysts' Dispersion						-0.080**	-0.066***
						(-2.50)	(-2.66)
Constant	1.837***	2.072***	1.731***	1.934***	1.488***	5.824***	5.110***
	(4.18)	(4.99)	(6.60)	(4.96)	(7.01)	(12.47)	(12.52)
Control 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control 2	No	No	Yes	No	Yes	Yes	Yes
Obs.	2,839	2,789	2,788	2,788	2,788	1,085	1,085
Adj. R^2	0.063	0.066	0.196	0.155	0.285	0.259	0.345

Control 1: firm size, book-to-market, investment, profitability, momentum, reversal, etc.
Control 2: β^{MKT}, β^{SMB}, β^{HML}, β^{CMA}, β^{RMW}, β^{LIQ}, and β^{UMD}

Manager Uncertainty and Firms' Real Actions

- Consistent with real options theory, high uncertainty leads to less investment and hiring but more working capital and cash holding.
- Similar finding by Bloom et al (2007 RES; 2018 Econometrica)

	(1) Investment	(2) Employment	(3) Working Capital	(4) Cash Holding
MU	-0.075***	-0.032**	0.122**	0.299*
	(-4.25)	(-2.32)	(2.19)	(1.79)
ln(total assets)	-0.092***	-0.094***	-0.051**	-1.174***
	(-16.56)	(-24.46)	(-2.51)	(-25.16)
Constant	0.706***	-0.419***	0.297***	6.432***
	(24.18)	(-18.90)	(3.25)	(22.17)
Firm-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Obs.	108,767	111,282	107,407	118,515
Adj. R^2	0.192	0.136	0.101	0.076

Robustness

- Robust alternative measurement of the MU
  - Drop extreme values (0 and 1)
  - Search only in Item 1A and Item 7A.
  - Use data after 2005 only

- Robust to return adjustment
  - Winsorize returns and truncate returns
  - Pricing at portfolio level

- Robust to methodology
  - Fama-MacBeth regression
  - Panel regressions with fixed effects (firm, industry, year)
  - Giglio and Xiu (2018)'s method to resolve omitted variables

Conclusions

- This paper introduces a novel measure of the degree of managers' uncertain beliefs about future states: manager uncertainty (MU).

- MU has incremental pricing power to cross-sectional stock returns.
  - MU reveals real options value of managers' uncertain beliefs.
  - MU captures mispricing between firms' disclosed uncertainty exposures and investors' perceived uncertainty exposures.
  - MU has stronger pricing power than beta loadings of aggregate uncertainty measures.
  - Manager uncertainty factor (MUF) cannot be spanned by factor models.

- Different with existing literature treats risk and uncertainty interchangeably, this paper evidences that the relative choice of the two words has economic implications.

Thank You !

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